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IV. *An Account of two cases, in which Ovules, or their Remains, were discovered in the Fallopian Tubes of Unimpregnated Women who had died during the period of Menstruation.* By H. LETHEBY, M.B., Lond., Lecturer on Chemistry and Medical Jurisprudence in the Medical School of the London Hospital. Communicated by T. B. CURLING, Esq., F.R.S.

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THE observations that have been made at various times, during the last thirty years, by Messrs. POWER, LEE, BARRY, WHARTON JONES, GIRDWOOD, and others in this country, together with the experimental researches of MM. VALENTIN, GENDRIN, WAGNER, BISCHOFF, POUCHET and RACIBORSKI on the Continent, have, I think, clearly proved that the phenomena manifested during the period of the catamenia in women, are closely connected with those observed during the time of heat or rut in quadrupeds; and that both of these phenomena are dependent on one cause, namely, the maturation of ovules. But while this hypothesis has been very generally admitted, there is, I believe, a tendency in the minds of many physiologists of the present day, to doubt whether the ovules so matured are ever extruded from the ovary and carried into the Fallopian tubes, without the stimulus of impregnation, or, at any rate, without the congress of the male. In support of this view, or rather of these doubts, an appeal is often made to the fact, that an ovule has never yet been detected in either of the Fallopian tubes of a virgin, who has died during the period of the catamenia, notwithstanding that many subjects have been examined, that most careful search has been instituted, and that appearances have frequently been noticed indicating the recent rupture of a Graafian follicle. In point of fact, it is imagined by those who entertain such doubts, that the fecundation of the germ takes place while it is within the Graafian follicle, and consequently, that if the ovule fails to be the subject of impregnation it never quits the ovary, but perishes within its formative vesicle. On the other hand, the researches of BISCHOFF have led him to enunciate a law, the purport of which is the very reverse of the preceding; for he says, that “the ovules formed in the ovaries of females of the human species and of mammiferous animals, undergo a periodical maturation, quite independently of the male seminal fluid. At these periods, known as those of heat or the rut in animals, and menstruation in the human female, the ovules which have become mature, disengage themselves from the ovary and are extruded. If the union of the sexes takes place, the ovule is fecundated by the direct action of the semen upon it. If no union of the

sexes occurs, the ovule is nevertheless extruded from the ovary, and enters the Fallopian tube, but there perishes*.”

The law, as thus expressed, is in conformity with the opinions entertained by Drs. ROBERT LEE, PATERSON, GIRDWOOD, GENDRIN, POUCHET, RACIBORSKI, Mr. WHARTON JONES, and many other authorities of the present time. It is also in accordance with the more ancient doctrines of MALPIGHI, Sir EVERARD HOME, and Dr. POWER. Nevertheless, as the truth of this law, in its application to the human female, appears to be still open to the evidence of positive proof, I have thought it desirable to publish a report of the two following cases.

Case 1st.—November the 20th, 1850, a woman aged twenty-six, in a state of great mental excitement, attempted self-destruction by cutting her throat. The wound which she inflicted was not dangerous; and after having been attended to by a surgeon for a few days, the woman was removed to the London Hospital, where she became a patient under Mr. CURLING. She lingered until the 14th day of December, when she died. On the following day the body was examined, and it was noticed that the pelvic viscera were highly congested, that the uterus was considerably enlarged, that the vagina contained a sero-sanguineous fluid, and that the hymen was unruptured. In consequence of these appearances the parts were removed for further examination.

On cutting into the uterus, I discovered that it contained a small quantity of sanious fluid; I noticed, moreover, that both of the ovaries presented a number of stellate fissures or cicatrices on their surfaces; and that at one part of the left organ, namely, at its inferior, inner and posterior border, there was a distinct purple spot of the size of a small pea. In the centre of this spot there was a ragged opening, that had, in all probability, recently given exit to an unimpregnated germ (*vide* Plate III. fig. 1). An incision was made into the gland, so as to cut through the discoloured portion of it, and it was then remarked that the aperture led into a small cavity, the existence of which is still evident in the wet preparation. The cavity was situated at the very summit of the spot, immediately within the opening on the peritoneal surface; and it was surrounded by a large quantity of what appeared to be extravasated blood (*vide* fig. 2). After the preparation had been immersed in spirit of wine for a few days, I was able to perceive that the spot was made up of four distinct parts;—1st, of an outer vascular layer which surrounded the mass, and extended into it to the depth of $\frac{1}{16}$ th of an inch; this layer was gradually thinned as it approached the aperture on the surface of the follicle; and it seemed to consist of *the stroma of the ovary* in a highly congested state. 2nd. Of a thin layer of very dark matter, which appeared to be the remains of *the ovisac*. 3rd. Of a mass of coagulated blood strengthened by a network of intersecting fibres; this mass had the bulk of a hemp-seed, and it was found to be composed of blood-discs, fibrin, and large granular corpuscles; it was, doubtless, therefore, the remains of *the tunica granulosa* in-

* Beweis der von der Begattung unabhängigen periodischen Reifung und Loslösung der Eier, p. 4, quoted by Drs. BALY and KIRKES in their Supplement to the second volume of MÜLLER's Physiology, p. 45.

filtrated with blood. 4thly, and lastly, there was *the cavity* to which I have before alluded.

When the ovaries had become firm and hard by the coagulating action of the spirit, sections were made into them at various parts; by which means a number of yellow bodies (false *corpora lutea*) in different stages of degeneration were brought into view. Some of these bodies were rather large, and one of them contained a well-defined clot, the summit of which communicated with a cicatrix on the surface of the ovary (see the preparation). This circumstance led me to conclude that it was the remains of an old Graafian follicle, from which, at perhaps the last catamenial period, an ovule had escaped.

The Fallopian tubes were highly congested, especially at their fimbriated extremities, where, from the abundance of turgid capillary vessels, the tubes assumed a bright scarlet appearance. The cavities of the oviducts were filled with, and much distended by, a thick bloody mucus, which readily escaped from their peritoneal apertures when the tubes were subjected to slight pressure between the finger and thumb. Both of the Fallopian tubes were carefully laid open by means of a pair of fine scissors—the operation being conducted on a clean white plate, containing a little water,—and their contents were minutely examined. The right tube did not present any object worthy of notice; but the left one contained, at about 1 inch from its distal extremity, a small white vesicular-looking body, which on being floated out into the water, was found to be rather ragged on its surface, and to have the size of the cavity noticed in the recently ruptured Graafian follicle. This body was submitted to microscopical examination. When viewed as an opaque object, nothing could be made out beyond the fact that it was covered with white flocculi. It was then placed between two pieces of glass, and examined by the aid of transmitted light; but it was too opaque for the eye to distinguish its structure, notwithstanding that the flocculi were very translucent and were seen to be made up of oval nucleated cells (see fig. 6). By the employment of slight pressure the body was readily crushed, and then I could perceive that it was composed of a mass of nucleated cells, among which, at one part, there was a number of highly refractive oil-globules (see fig. 5). The result of this investigation led me to think that the body in question was an ovule, the elements of which had been so far disarranged by the pressure, that the *membrana granulosa* and *yellk-globules* were the only recognisable constituents of it.

The fluid contained in the uterus and Fallopian tubes were likewise subjected to microscopical examination. That removed from the former was found to consist of numerous blood-discs, most of which were strongly beaded at their edges; of much cylindrical epithelium, some of which was distinctly ciliated; of a large quantity of granular corpuscles, like exudation cells; of a few white globules, similar to those found in blood, many of which had apparently passed into the form of spindle-shaped or fusiform bodies by the elongation of their opposite ends; and of a thick gelatinous fluid which united all the elements together (see fig. 3). That from the latter, namely,

the Fallopian tubes, was much the same as the preceding, excepting that the number of the blood-discs was considerably less; that there was a greater abundance of ciliated epithelium; and that the fluid in which the elements floated was not gelatinous, but serous (see fig. 4).

A consideration of the facts thus presented to notice, led me to conclude that the girl had died at the very onset of a catamenial period, for I could not discover any evidence of the occurrence of an external flow; in fact, the secretion found in the vagina was not very abundant, and it had acquired only a pale rose tint.

On instituting a further inquiry into the case, I ascertained that the periodical flux had taken place exactly one week before the woman made the attempt on her life; and with regard to the subsequent history of the case, it may be said that she was laid up with the wound in her throat for a period of twenty-four days before her death, nineteen of which were passed in a separate ward of the Hospital, where, in consequence of her very distressing condition, she was closely watched by a female attendant, so that it is hardly possible that sexual intercourse could have been effected during that period of time.

While I was engaged in the investigation of the preceding case, I received from my friend Dr. PARKER of Finsbury Square, who had assisted me in the foregoing inquiry, another uterus and its appendages, which he had removed from the body of a lunatic aged twenty-three. This girl had died, and was examined in St. Luke's Hospital, where she had been a patient for eleven months, under circumstances which deprived her of the opportunity of associating with a male for a long period before her death.

The information obtained by inquiries of the attendant at St. Luke's, as well as by an examination of the organs themselves, led me to conclude that the girl had quitted life during the catamenial period; for the pelvic viscera were much congested, the uterus was considerably enlarged, its vessels were turgid, and its cavity contained a red jelly-like matter; besides which, the Fallopian tubes were filled with a thick muco-sanguineous secretion, and the right ovary presented a dark livid spot on its outer and lower part: many cicatrices were also found on the surfaces of both the ovaries. As in the last case, the livid spot had a hole in its centre; and, on making a section of the ovary so as to divide it through the spot and an adjacent cicatrix, I perceived that the hole led into a cavity, which was surrounded by a deep red tissue, and that the cicatrix communicated with a very perfectly formed *corpus luteum*, having a central cavity containing a dark red clot (see fig. 7 and preparation).

The matter contained in the right Fallopian tube was submitted to careful examination, by which means I discovered a little globular body that had the size of a small pin's head. This body was transferred, as in the last case, to water; then placed between two pieces of glass, and examined under the microscope with a power of 100. The outer constituents of the mass were precisely like those of the preceding; that is, they consisted of nucleated cells, arranged so as to form a shaggy, but tolerably

compact tunic. At one end of the object, near to its surface, there was a transparent ring, enclosing a rather opaque granular mass, in which there was an eccentric, highly pellucid spot (see fig. 9). I had no doubt that this was the ovule, consisting of the *zona pellucida*, the *yelk* and the *germinal vesicle*; but, to test the truth of my opinion, I subjected the mass to the action of a little strong acetic acid, by which means the *zona pellucida* was still more clearly brought into view; for it happened that the nucleated cells of the *membrana granulosa* were slightly corrugated by the acid, and, as it were, contracted on their contents. They also acquired a greater transparency; and by using a power of 300, the *zona* presented a distinctly striated appearance, and the granules within it were seen to be highly refractive. Lastly, the whole object was washed with ether, which dissolved away the fat granules, and thus left the *zona* and *vesicle* still more distinct. In the place of the *yelk* there was now left a somewhat opaque structureless material, which seemed to have been the bond of union between the numerous fatty elements of the vitelline mass (see fig. 10).

The fluid matters contained in the uterus and Fallopian tubes, were identical in their physical characters with those noticed in the last case; and the materials composing the recently ruptured Graafian follicle were likewise found to consist of blood-discs, fibrin and large nucleated cells (see fig. 11). The yellow tissue of the *corpus luteum* was made up of a fibro-cellular stroma, in which there was enclosed a number of large granular corpuscles, some of which contained oil-globules; besides these, there was a liquid fat diffused through the tissue, which appeared either as minute particles, or as large elongated highly refractive globules that had been produced by the union of the smaller elements (see fig. 10).

Remarks.—An examination of the preceding facts will, I think, justify me in coming to the following conclusions; namely, *that ovules escape from the ovaries of women during the catamenial flux; and that the escape of these bodies is spontaneous, id est, that their extrusion takes place independently of sexual intercourse.* In these respects, the phenomena witnessed are perfectly analogous with those observed by BISCHOFF, RACIBORSKI, POUCHET and others, while they were instituting inquiries into the changes which occur in the ovaries of other mammals during the periods of heat and rut; and they are also in accordance with a fact long since ascertained by physiologists, namely, that there is a periodical maturation and spontaneous extrusion of ovules from the ovaries of animals still lower in the scale of creation. Hitherto, however, these several circumstances have been regarded only in the light of probable analogies; but I am of opinion that the facts detailed in this paper are quite sufficient to identify the phenomena in question, and also to establish the truth of a great part of the law enunciated by BISCHOFF, that is, that the ovules formed in the ovaries of females of the human species, and of mammiferous animals, undergo a periodical maturation, quite independently of the influence of the male seminal fluid; and that at the periods of menstruation in the one, and heat in the other, the ova which have become mature disengage themselves from the ovary, and are extruded

whether there be access of the male or no. But admitting that this law is in great part the expression of truth, we have yet to determine whether in human females, as in the females of other animals, the maturation and escape of ovules take place only at the fixed periods mentioned, or whether the discharge of these bodies is always occurring, thus rendering the human female susceptible of impregnation at all times. The final solution of these questions, together with that of the problem concerning the length of time that the ovule retains its faculty of being fecundated after it has quitted the ovary, is of great interest to the physiologist, the obstetric physician, and the medical jurist; for it would not only enable them to pronounce with certainty at what time conception usually takes place, but it would also furnish a starting-point for the determination of other equally important problems, viz. the ordinary, and the most extended periods of human gestation. It must, however, be evident that a great number of independent observations have yet to be made, before any hypothesis relating to this part of the subject can take its place amongst the well-recognised doctrines of science; and, believing that each observation must have some weight and value, I have been led to record the results of my own inquiries, in order that they may be placed in juxtaposition with the facts already elicited by more able investigators. Here, perhaps, I may be allowed to remark, that in addition to the experiments and observations so admirably reviewed by Drs. Baly and Kirkes in their Supplement to the second volume of Professor MÜLLER's Physiology, two cases have been published, in which the phenomena witnessed are in many respects very similar to those noticed by myself. In one of these cases, the girl died shortly after menstruation; and the reporter, M. JANZER, states that, in making an examination of her body, he found on the surface of the left ovary a dark red spot, which had a fissure in its centre. Judging from all the circumstances of the case, JANZER was led to conclude that the spot in question was a recently ruptured Graafian follicle gorged with blood. He instituted a diligent search for the liberated ovule, but he failed to discover it*. The second case is recorded by M. LOCATELLI†; and he informs us that the woman who was the subject of his investigations died from the effects of an operation made for the relief of an imperforate hymen. He noticed that on one of the ovaries there was a livid spot, in the centre of which there was an aperture. The parts were carefully examined, and the author believes that the spot seen in the ovary was a recently ruptured follicle filled with blood. As in the last case, however, the liberated ovule escaped detection.

* Heidelberg Annalen, Bd. xiii. p. 601-604.

† Frorieps Neue Notizen, Bd. vii. p. 348-350.

Fig. 1.

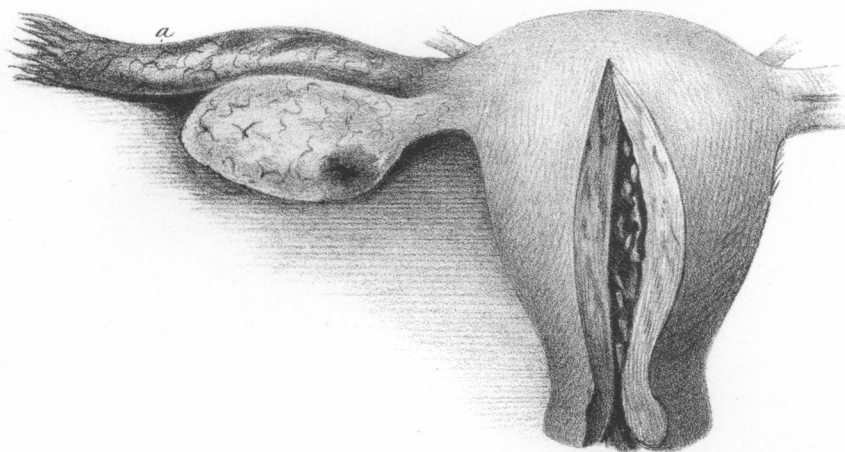


Fig. 2.

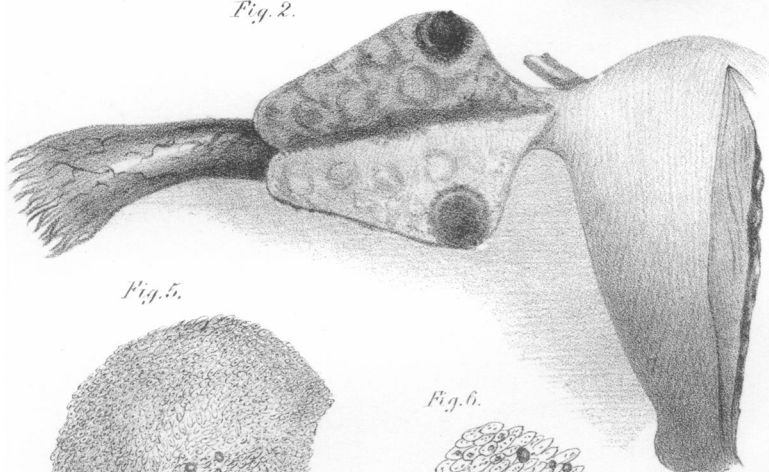


Fig. 5.

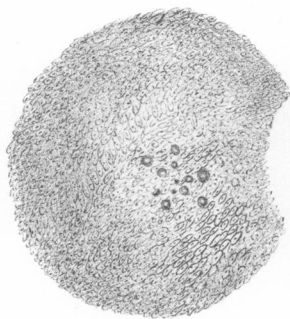


Fig. 6.



Fig. 9.

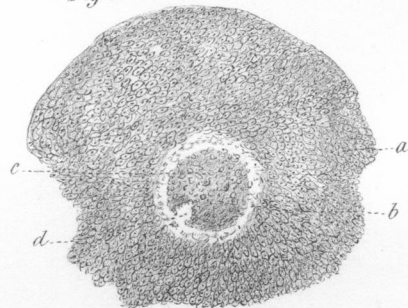


Fig. 8.

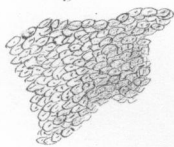


Fig. 10.

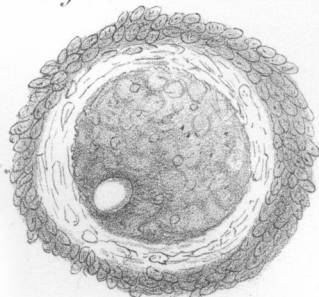


Fig. 11.

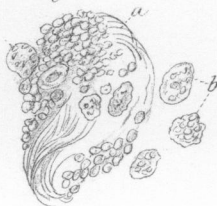


Fig. 3.

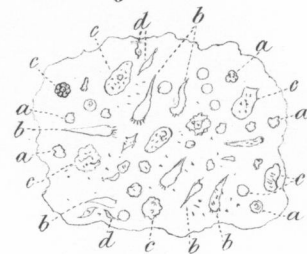


Fig. 4.

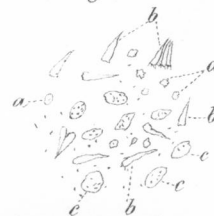


Fig. 7.

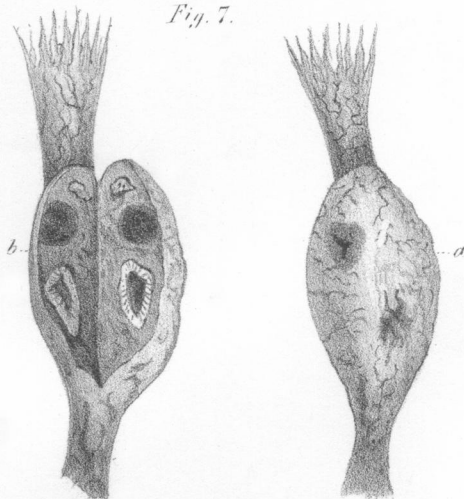
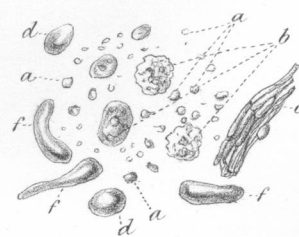


Fig. 12.



EXPLANATION OF THE PLATE.

PLATE III.

Fig. 1. *The uterus and its appendages* as seen from behind. The uterus is laid open by a longitudinal incision in order to show the contained menstrual fluid. The Fallopian tube is highly congested, and its cavity is much distended with sanguinolent mucus. The ovary presents several cicatrices on its surface; and at the inner and lower margin it exhibits a purple spot, in the centre of which there is a small opening through which the ovule had recently escaped.

(a.) The spot at which the ovule was found.

Fig. 2. *The left ovary* laid open in a line through the centre of the purple spot, showing the cavity from which the ovule had escaped, surrounded by a clot of dark blood, most of which was effused into the substance of the Graafian follicle.

Fig. 3. *A portion of the sanguinolent matter taken from the uterus*, and magnified about 200 times. It was found to consist of blood-discs, most of which were beaded at the edges (*a a*); of ciliated and cylindrical epithelium (*b b*); of granular corpuscles, some of which were oval and others round (*c c*); of spindle-shaped bodies (*d d*); of numerous minute granules; and of a thick gelatinous fluid which bound all the elements together.

Fig. 4. *Fluid from the Fallopian tube*, treated in like manner: it consisted of nearly the same elements. The fluid in which the corpuscles floated was, however, of a serous, not a gelatinous character.

N.B. To prevent obscurity, only a few of each of the elements have been figured.

Fig. 5. *A portion of the ovule mass* taken from the left Fallopian tube, and magnified 200 times. The entire mass consisted of nucleated cells (*membrana granulosa*) arranged in an irregular manner. Interspersed through the cells were many oil-globules, probably the broken-down yolk.

Fig. 6. *A part of the middle of the mass*, magnified still more, showing the arrangement of the cells and the position of the oil-globules.

Fig. 7. *The right ovary* removed from the uterus and placed vertically.

(a.) The external surface showing several stellate cicatrices; and at its

outer and lower part it also exhibits a purple spot, in which there is an aperture from which the ovule has escaped.

(b.) The same ovary divided longitudinally through the cicatrix and spot, by which means two false *corpora lutea*, and the ruptured Graafian vesicle were brought into view.

Fig. 8. *A part of the shaggy surface of the ovule*, magnified 200 times, showing the arrangement of the nucleated cells which compose it.

Fig. 9. *The ovule* crushed between glass and magnified 100 times: exhibiting the cellular envelope (a); the transparent zona pellucida (b); the yolk (c); and the germinal vesicle (d).

Fig. 10. *The same*, after having been treated with acetic acid and then with ether; magnified 300 times.

Fig. 11. *A portion of the Graafian follicle* from which the ovule has just escaped, magnified 200 times: (a) a clot containing blood-discs, fibrin and large nucleated cells; (b) some of the cells disengaged.

Fig. 12. *A portion of a corpus luteum*, magnified 200 times; consisting of small fat-globules (a a); large nucleated cells containing fat-globules (b b); (c c) a part of the tissue showing a structure composed of fusiform or fibrous cells; and (d d) large fat-globules formed by the aggregation of smaller ones; at ff they have assumed other forms, in consequence of their having been pressed between the glass.